REPORT OF THE SOUTH CAROLINA SEA GRANT CONSORTIUM

July 1, 1982-June 30, 1983

Report of

THE SOUTH CAROLINA SEA GRANT CONSORTIUM

BOARD OF DIRECTORS

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S. C. Wildlife and Marine Resources Department

Margaret A. Davidson
Director

Fiscal Year
July 1, 1982-June 30, 1983

SOUTH CAROLINA SEA GRANT CONSORTIUM

STAFF

Margaret A. Davidson, *Director* ..... Charleston
Malcolm R. DeVoe, *Assistant Director* ..... Charleston
Ernesto M. Torres, *Comptroller* ..... Charleston
Anne R. Hill, *Communication Coordinator* ..... Charleston
Elaine L. Knight, *Accounting Technician* ..... Charleston
Audrey B. Brownlee, *Executive Secretary* ..... Charleston

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John L. Keener, *Extension Marine Advisory Agent* ..... Charleston
Jack Whetstone, *Extension Marine Advisory Agent* ..... Georgetown
Thomas Potts, *Extension Marine Advisory Agent* ..... Beaufort
E. A. Gaffney, *Extension Marine Advisory Agent* ..... Charleston
Henrietta S. Wilson, *Editorial Assistant* ..... Charleston
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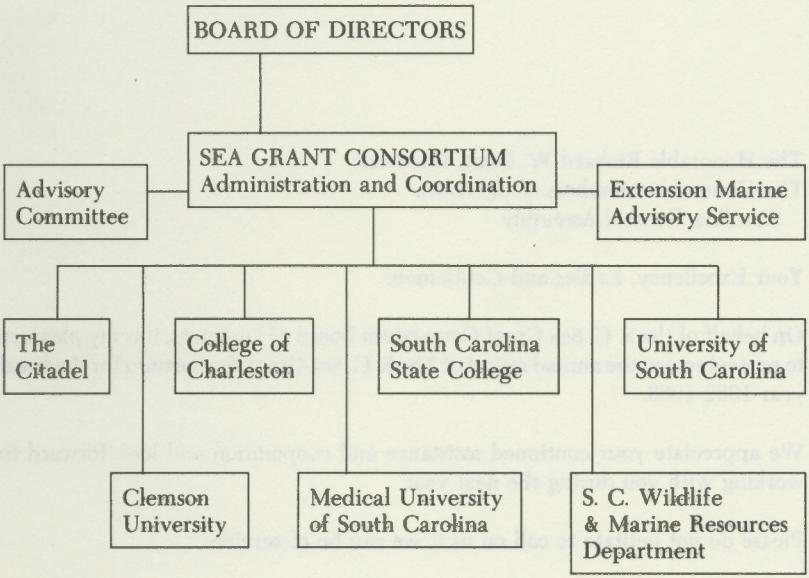
SOUTH CAROLINA SEA GRANT CONSORTIUM

ORGANIZATION CHART



MEMBER INSTITUTION ON-SITE COORDINATORS

Dr. Robert Baldwin
Department of Biology
The Citadel

Dr. Thomas C. Cheng
Marine Biomedicine Research Program
Medical University of South Carolina

Dr. Paul B. Zielinski
Environmental Systems Engineering
Clemson University

Dr. James Arrington
Department of Natural Sciences
South Carolina State College

Dr. Paul Hamill
Office of Research
College of Charleston

Dr. Paul A. Sandifer
Marine Resources Research Institute
S. C. Wildlife and Marine Resources Department

Dr. John M. Dean
Department of Marine Science
University of South Carolina

The Honorable Richard W. Riley, Governor
The Honorable Members of the South
Carolina General Assembly

Your Excellency, Ladies and Gentlemen:

On behalf of the S. C. Sea Grant Consortium Board of Directors, it is my pleasure to present to you the annual report of The S. C. Sea Grant Consortium for the fiscal year 1982-1983.

We appreciate your continued assistance and cooperation and look forward to working with you during the next year.

Please do not hesitate to call on us if we can be of service.

Respectfully submitted,

BOARD OF DIRECTORS
S. C. SEA GRANT CONSORTIUM

MAJOR GENERAL JAMES A. GRIMSLEY, JR.
Chairman

August 20, 1983

Major General James A. Grimsley, Jr.
Chairman, Board of Directors
S. C. Sea Grant Consortium
Charleston, South Carolina 29412

Sir:

Attached hereto is the annual report of The South Carolina Sea Grant Consortium for fiscal year 1982-1983.

This report contains a description of the activities and accomplishments of Sea Grant Consortium programs in marine and coastal research, education, and advisory services. More detailed information is available and can be supplied upon request.

We look forward to working with you and the Board of Directors during this next year.

Respectfully submitted,

MARGARET A. DAVIDSON
Director

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THE SOUTH CAROLINA SEA GRANT CONSORTIUM

Created by South Carolina Act. No. 643 in 1978, the principal purpose of the South Carolina Sea Grant Consortium is to provide a mechanism for the development and management of the Sea Grant Program for the State of South Carolina and adjacent regions that share a common environment and resource heritage. The Consortium serves to support, improve and share research, education, training and advisory services in fields related to ocean and coastal resources. The Consortium also encourages and follows a regional approach to solving problems or meeting needs relating to ocean and coastal resources in cooperation with appropriate sea grant colleges, sea grant programs and persons in the region.

Charter Members

The membership of the Consortium consists of The Citadel, the College of Charleston, Clemson University, The Medical University of South Carolina, South Carolina State College, the University of South Carolina and the Wildlife and Marine Resources Department. These members are designated as charter members.

The terms of the members are perpetual, and a majority of the charter members may vote the admission of a new member into the Consortium.

Board of Directors

The board of directors for the Consortium is comprised of the chief executive officer of each of the participating educational institutions and state agencies or his designee.

Executive Director

The board has the express power to employ the Sea Grant Director, who has the following powers and duties:

1. To direct supervision over all sea grant proposals;
2. To prepare annual sea grant proposals to be submitted to the National Sea Grant Office;
3. To set exact funding levels for proposals submitted by member institutions and subsequently approved by the National Sea Grant Office;
4. To maintain and control the Sea Grant Director's discretionary fund;
5. To request and receive funds from local, state, federal and private sources for use by the director, Consortium, individual member institutions, or other persons;
6. To exercise all incidental powers necessary to carry out the provisions of this act.

Advisory Committee

The Sea Grant Director is assisted by an advisory committee which consists of seven members who serve for four-year terms. Four members are appointed by the Governor with the advice and consent of the Senate. The Chairmen of the

Senate Fish, Game and Forestry Committee, House Agriculture and Natural Resources Committee and South Carolina Wildlife and Marine Resources Commission also appoints one member upon the recommendation of a majority of the members of their respective committees and commission. The four members appointed by the Governor are residents of coastal counties, no more than one from each county, and two are associated with the commercial fishing industry. The initial non-gubernatorial appointees serve for terms of two years only.

FISCAL REPORT

BALANCE SHEET
Fiscal Year 1982-1983

Assets		
Current Funds:		
Cash on hand	$ 200	
Accounts Receivable	3,822	
State Treasurer	32,382	
		$36,404
Restricted Funds:		
Due from Grantor	$ 2,484	
State Treasurer	13,800	
		$16,284
Total Current Funds		$56,688
Fixed Assets		
Equipment Inventory	$53,574	
		$53,574
Total Fixed Assets Funds		$53,574

Liability and Fund Balances		
Current Funds:		
Unrestricted	$	
Accounts Payable	2,490	
Accrued Payroll & FB	1,949	
Due to State General Fund	31,965	
		$36,404
Restricted Funds		
Accounts Payable	$ 635	
Deferred Revenue	15,649	
		$16,284
Total Current Funds		$52,688
Fixed Assets Funds		
Funds Balance	$53,574	
		$53,574

STATEMENT OF CHANGES IN CURRENT OPERATING FUNDS YEAR ENDED JUNE 30, 1983

	Administration and Research
Balance — July 1, 1982	$ 200
Additions:	
Revenues	318,585
Deductions:	
Expenditures	286,820
Balance Due to General Fund	$ 31,965

STATEMENT OF CHANGES IN RESTRICTED AND OTHER FUNDS YEAR ENDED JUNE 30, 1983

	Balance June 30, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
Sea Grant Contracts 81-82	$ 2,399	$261,547	$263,946	$
Sea Grant Contracts 82-83		203,452	196,396	7,056
Other Restricted Contracts	14,581	53,225	59,213	8,593
Total	$16,980	$518,224	$519,555	$15,649

STATEMENT OF CHANGES FIXED ASSET FUND YEAR ENDED JUNE 30, 1983

	Balance June 30, 1982	*Total Addition*	*Total Deduction*	*Balance June 30, 1983*
Capital Equipment	$38,197	$1,842		$40,039
Motor Vehicle Equipment	13,535			13,535
Totals	$51,732	$1,842		$53,574

STATEMENT OF CHANGES IN CURRENT OPERATING FUNDS YEAR ENDED JUNE 30, 1983

Revenues:	*Administrative and Research*
State Appropriation	$318,585
Total Revenue	318,585
Expenditures:	
Administration and Research (Schedule I)	286,820
Total Expenditures	286,820
Excess of Revenues Over Expenditures	$ 31,765

SCHEDULE OF CURRENT UNRESTRICTED EXPENDITURES YEAR ENDED JUNE 30, 1983

	Budgets	*Expenditures*
Personal Service	$156,793	$135,544
Fringe Benefits	30,011	23,382
Payments to Sub-Grantees	56,299	50,589*
Contractual Service	20,939	23,648
Supplies	12,884	12,176
Fixed Charges	30,165	30,089
Equipment	2,000	1,899
Travel	9,494	9,493
Total Expenditures	$318,585	$286,820

*PAYMENT TO SUB-GRANTEES

Grant Title	*Budget*	*Expenditures*
Coastal Wetland Impoundments	$ 3,550.00	$ 3,463.87
Advisory Work — Summer '82	1,500.00	1,500.00
Marine Education Association Meeting	1,000.00	1,000.00
S. C. Swordfish — Supplement	1,950.00	1,950.00
Society for Environmental Toxicology Mtg.	460.00	460.00
Precursor for Groundwater	1,650.00	1,644.80
Legal Advisory Program	5,500.00	1,139.80
Knobbed Whelk Fishery	4,500.00	4,439.60
History of S. C. Fisheries Supplement	2,550.00	2,448.18
Travel Support, Manzi	318.00	318.00
Coastal Cruising Guide	1,150.00	1,150.00
Evaluation of Mosquitos in Coastal Impoundments	6,200.00	6,091.21
Groundwater Recharge Potential	6,900.00	5,857.43
Synthetase from Shrimp	4,000.00	3,858.03
Wingwall Shoreline	6,500.00	6,359.59
Travel Support, Hite	275.00	273.40
Lease Fees for Oyster Lands	6,000.00	6,000.00
Caribbean Marine Development Workshop	250.00	250.00
Tourism Forecasting	900.00	900.00
Travel Support, Brana-Shute	700.00	700.00
Coop Program — Marine Studies	785.00	785.00
International Program — IPA	5,339.00	5,339.15
	$61,977.00	$55,928.06
In House		$ 5,339.15
Payments to Sub-Grantees		$50,588.91

STATEMENT OF CHANGES IN SEA GRANT CONTRACTS 81-82
YEAR ENDED JUNE 30, 1983

	Balance July 1, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
Sea Grant Administration	$2,399	$ 2,739	$ 5,138	
Communication		3,810	3,810	
Aquaculture Workshop				
Coastal Heritage Photography				
Tidel Inlet Atlas Production				
Medicinal Agents of the Salt Marsh		7,481	7,481	
Coastal Heritage "History of the S. C. Coast"		3,196	3,196	
Age Determination of Ecology of S. C. Swordfish		9,071	9,071	
International Biomineralization Symposium				
The Evolution of Fisheries		944	944	
Atmospheric Deposition of Toxaphene		6,869	6,869	
Invt. of Toxic Substances of Spartina		6,057	6,057	
Dev. of Marine ETV in S. C.		6,547	6,547	
Invertebrates Which Modify Resistance		8,025	8,025	
Survivorship & Bioenergetics of Clam		3,225	3,225	
Precursor for Groundwater Resources				
Telephone & Postage Support				
Parasites of Cultured American Eel		11,567	11,567	
Dev. & Eval. of Auto Shrimp Deheader		12,768	12,768	
Marine Advisory Services		84,043	84,043	
Repro. & Dev. of Sharks & Rays		11,566	11,566	
Lab Investigations of Bulkheads		15,907	15,907	
Hard Clam Culture in S. C.		11,046	11,046	
World Mariculture Society Meeting				

	Balance July 1, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
Artificial Insemination of Shrimp		5,180	5,180	
Demo. of Commercial Prawn		9,901	9,901	
Dev. & Demo. of Finfish Mariculture		8,597	8,597	
Dev. of Applied Sci. Curr. in Charleston		314	314	
Nursery Culture of Juvenile Mollusks		2,049	2,049	
Summer Research Support				
Private Prawn Growers		7,040	7,040	
Multi-Jurisdictional Waterfront		8,427	8,427	
Use of Copper Compounds in Oysters & Clams		9,390	9,390	
CHEC Graduate Research MPA		3,562	3,562	
Minority Research		2,226	2,226	
Total Sea Grant Contracts	$2,399	$261,547	$263,946	

STATEMENT OF RESTRICTED EXPENDITURES
SEA GRANT CONTRACTS 1981-82
YEAR ENDED JUNE 30, 1983

	Personal Services	*Fringe Benefits*	*Contractual Services*	*Sub-Grant*	*Supplies*	*Fixed Charges*	*Equipment*	*Travel*	*Total*
Sea Grant Administration	$2,702	$197	$(2,021)	$	$ 57		$(57)	$1,861	$ 2,739
Communication			2,647		773			390	3,810
Aquaculture Workshop									
Coastal Heritage Photography									
Tidal Inlet Atlas Production									
Medicinal Agents of the Salt Marsh				7,481					7,481
Coastal Heritage "History of the S. C. Coast"				3,196					3,196
Age Det. & Eco. of S. C. Swordfish				9,071					9,071
Int. Biomineralization Symposium									
The Evolution of Fisheries				944					944
Atmospheric Deposition of Toxaphene				6,869					6,869
Invt. of Toxic Substances of Spartina				6,057					6,057
Dev. of Marine ETV in S. C.				6,547					6,547
Invertebrates Which Modify Resistance				8,025					8,025
Survivorship & Bio-Energetics of Clam				3,225					3,225
Precursor for Groundwater Resources									

Telephone & Postage Support								
Parasites of Cultured American Eel				11,567				11,567
Dev. & Eval. of Auto Shrimp Deheader				12,768				12,768
Marine Advisory Services				84,043				84,043
Repro. & Devlp. of Sharks & Rays				11,566				11,566
Lab Invest. of Bulkheads				15,907				15,907
Hard Clam Culture in S. C.				11,046				11,046
World Mariculture Society Meeting								
Artificial Insemination of Shrimp				5,180				5,180
Demo. of Commercial Prawn				9,901				9,901
Dev. & Demo. of Finfish Mariculture				8,597				8,597
Dev. of Applied Sci. Curr. in Chas.				314				314
Nursery Culture of Juvenile Mollusk				2,049				2,049
Summer Research Support								
Private Prawn Growers				7,040				7,040
Multi-Jurisdictional Waterfront				8,427				8,427
Use of Copper Compounds in Oysters & Clams				9,390				9,390
CHEC Graduate Research MPA				3,562				3,562
Minority Research				2,226				2,226
	$2,702	$197	$ 626	$254,998	$830	$(57)	$2,251	$261,547

STATEMENT OF CHANGES IN SEA GRANT CONTRACT 1982-83 YEAR ENDING JUNE 30, 1983

	Balance July 1, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
Sea Grant Administration		$ 22,913*	$15,857	$7,056
Communications		4,732	4,732	
Medicinal Agents of the Salt Marsh		9,566	9,566	
Teacher Training Use of Mar. Educ. Mats.		2,862	2,862	
Age Determination & Ecology of S. C. Swordfish		10,243	10,243	
Research Support — Inazuka				
Cost of the Federal Flood Ins. Program		4,768	4,768	
User Fees for Coastal Res. Issues		3,630	3,630	
Submerged Lands Conference — Trainee Support				
Coastal Wetland Impoundments Tasks II & IX		8,842	8,842	
Toxaphene at N. Inlet Estuary		14,756	14,756	
Coastal Wetland Impoundments Task III		11,575	11,575	
Coastal Wetland Impoundments Task V		955	955	
Coastal Wetland Impoundments Task VI		7,915	7,915	
Travel Support — Colquhoun		620	620	
Coastal Wetland Impoundments Task I		3,000	3,000	
Marine Extension Advisory Service		8,345	8,345	
Reproduction and Development of Sharks & Rays		6,110	6,110	
Power Boaters and Sail Boaters				
Synthetase from Shrimp				
Nursery Culture of Juvenile Mollusks		21,059	21,059	
Coastal Wetland Impoundments Task I		1,500	1,500	

	Balance July 1, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
Coastal Wetland Impoundments Task VII		19,356	19,356	
Vitro Fertilization of Decapod Crustaceans		9,711	9,711	
Coastal Wetland Impoundments Task VIII		9,061	9,061	
Coastal Wetland Impoundments Task X				
Dissemination of Marine Research Info.				
Devlp. & Demo. of Finfish Mariculture		19,067	19,067	
Stone Crab Assessment				
Low Country Science Fair		1,500	1,500	
Institute of Marine and Coastal Studies — Travel		1,000	1,000	
Lmtd. Entry Mg. Option of Shrimp				
Marine Studies on Minority Education				
Coastal Wetland Impoundments Task IV		366	366	
		$203,452	$196,396	$7,056

Note: Cash Balance on Federal Account Subsidiary was included in Sub-Contract Control — $7,055.82 credit was decreased Revenue.

STATEMENT OF RESTRICTED EXPENDITURES
SEA GRANT CONTRACTS 1982-83
YEAR ENDING JUNE 30, 1983

	Personal Service	*Fringe Benefits*	*Contractual Services*	*Sub Grant*	*Fixed Charges*	*Equipment*	*Travel*	*Total*
Sea Grant Administration	$2,541	$430	$ 8,474	$			$4,412	$ 15,857
Communications			3,332				1,400	4,732
Medicinal Agents of the Salt Marsh				9,566				9,566
Teacher Training Use of Mar. Educ. Mats.				2,862				2,862
Age Determination & Ecology of S. C. Swordfish				10,243				10,243
Research Support — Inazuka ..								
Cost of the Federal Flood Insurance Prog.				4,768				4,768
User Fees for Coastal Res. Issues				3,630				3,630
Submerged Lands Conference Trainee Support								
Coastal Wetland Impoundments Tasks II & IX				8,842				8,842
Toxaphene at N. Inlet Estuary .				14,756				14,756
Coastal Wetland Impoundments Task III				11,575				11,575
Coastal Wetland Impoundments Task V				955				955
Coastal Wetland Impoundments VI				7,915				7,915
Travel Support — Colquhoun .				620				620
Coastal Wetland Impoundments Task I				3,000				3,000
Marine Extension Advisory Service				8,345				8,345
Reproduction and Development of Sharks & Rays				6,110				6,110
Power Boaters and Sail Boaters								

	Personal Service	*Fringe Benefits*	*Contractual Services*	*Sub Grant*	*Fixed Charges*	*Equipment*	*Travel*	*Total*
Synthetase from Shrimp								
Nursery Culture of Juvenile Mollusks				21,059				21,059
Coastal Wetland Impoundments Task I				1,500				1,500
Coastal Wetland Impoundments Task VII				19,356				19,356
Vitro Fertilization of Decapod Crustaceans				9,711				9,711
Coastal Wetland Impoundments Task VIII				9,061				9,061
Coastal Wetland Impoundments Task X								
Dissemination of Marine Research Inf.								
Devlp. & Demo. of Finfish Mariculture				19,067				19,067
Stone Crab Assessment								
Low Country Science Fair				1,500				1,500
Institute of Marine and Coastal Studies — Travel				1,000				1,000
Lmtd. Entry Mgt. Option of Shrimp								
Marine Studies on Minority Education								
Coastal Wetland Impoundments Task IV				366				366
	$2,541	$430	$11,806	$175,807			$5,812	$196,396

STATEMENT OF CHANGES OF OTHER RESTRICTED CONTRACTS
YEAR ENDED JUNE 30, 1983

	Balance July 1, 1982	*Total Additions*	*Total Deductions*	*Balance June 30, 1983*
National Marine Fisheries	$	$	$	$
Publication — Tidal Inlet Atlas		7,800	7,800	
Dreyfus Foundation	1,200		268	932
Intergovernmental Personnel Act	5,039	12,798	17,837	
Coastal Heritage Phase I	5,111		3,961	1,150
Coastal Heritage Phase II	3,231	16,635	14,355	5,511
Coastal Heritage Supplement		1,000		1,000
Use of Wingwalls to Minimize Adjacent Shore Erosion		10,000	10,000	
Groundwater Recharge Potential		4,358	4,358	
Reconnaissance of Dredged Material		357	357	
Generated Account		277	277	
	$14,581	$53,225	$59,213	$8,593

STATEMENT OF OTHER RESTRICTED EXPENDITURES
YEAR ENDED JUNE 30, 1983

	Personal Service	*Fringe Benefits*	*Contractual Service*	*Sub-Contract*	*Supplies*	*Fixed Charges*	*Travel*	*Total*
National Marine Fisheries ..	$	$	$	$	$	$	$	$
Publication — Tidal Inlet Atlas			7,800					7,800
Dreyfus Foundation							268	268
Intergovernmental Personnel Act	15,112	2,725						17,837
Coastal Heritage Phase I ...			3,918	43				3,961
Coastal Heritage Phase II ..			1,762	10,683	1,035	875		14,355
Coastal Heritage Supplement								
Use of Wingwalls to Minimize Adjacent Shore Erosion				10,000				10,000
Groundwater Recharge Potential				4,358				4,358
Reconnaissance of Dredged Material				357				357
Generated Account			100		177			277
	$15,112	$2,725	$13,580	$25,441	$1,212	$875	$268	$59,213

Notes to Financial Statements
June 30, 1983

Note 1 — Summary of Significant Accounting Policies

Basis of Accounting:

The financial statements have been prepared on an accrual basis.

Fund Accounting:

To ensure observance of limitations and restrictions placed on the use of resources available to the Consortium, the accounts are maintained in accordance with the principles of fund accounting. This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds that are in accordance with specified activities or objectives. Separate accounts are maintained for each fund.

General Fixed Assets:

Fixed assets are recorded as expenditures of the general operating fund upon acquisition and subsequently capitalized at actual cost in the general fixed asset account group. In accordance with generally accepted accounting principles prescribed for governmental funds, a provision for depreciation of general fixed assets is not recorded.

Grant Accounting:

The Consortium is a State agency involved in ocean and coastal research, education, and advisory extension work. It serves to encourage, coordinate and facilitate projects pertaining to coastal and ocean areas of South Carolina and utilize the talents of its members to address marine issues.

The Consortium identifies possible problems of concern to the State of South Carolina which meet Grant criteria. The Consortium then arranges for the design of a project, usually by member agencies, to investigate the problem. On an annual basis, the projects are submitted to grantors for funding. A majority of the projects funded are then sub-contracted to various member agencies.

Expenditures by sub-grantees under the sub-contracts which have not been reimbursed to the sub-grantee by the Consortium at June 30, are included in accounts payable. Likewise, expenditures paid or payable by the Consortium at June 30, and not yet reimbursed by the primary grantor are recorded as accounts receivable. Revenues received on specific grants which are in excess of expenditures are recorded as deferred revenues.

Note 2 — Retirement Plan

Substantially all employees of the Consortium are covered by a retirement plan through the South Carolina Retirement System. It was not feasible to separately identify current year retirement plan cost included as a portion of employer contributions in the accompanying financial statements.

Information regarding the excess, if any, applicable to the Consortium of the actuarially computed value of vested benefits over the total of the pension fund and any balance sheet accruals, less any pension pre-payments of deferred charges is not available. By State Law, the Consortium's liability under the retirement plan is limited to the amounts appropriated therefore in the South Carolina Appropriation Act for the fiscal year 1981, plus the amount paid from other revenue sources for the current year. Accordingly, the Consortium recognizes no contingent liability for unfunded costs associated with participation in the plan.

Note 3 — Contingent Liabilities

The Consortium has numerous contracts with the Federal Government and other State agencies for the reimbursement of specific costs related to the various programs described in each contract. Reimbursement costs subsequently deemed to be unallowable by the sponsoring entity, if any, would have to be repaid. A material amount of the contracts are in-turn subcontracted by the Consortium and reimbursed costs deemed to be unallowable would result in a claim by the Consortium against the sub-contractor.

Note 4 — Changes in General Fixed Assets

Changes in general fixed assets for the year ended June 30, 1983 are as follows:

	Balance July 1, 1982	*Additions*	*Deletions*	*Balance June 30, 1983*
Equipment . . .	$51,732	$1,842		$53,574

OVERVIEW

The South Carolina Sea Grant Consortium is a unique partnership of universities, colleges, and state agencies working to promote and implement research, education, and advisory services in the sphere of marine and coastal resources. The Consortium accomplishes these concurrent tasks by drawing on the diverse and extensive talents and expertise available at its seven constituent institutions:

- The Citadel
- Clemson University
- College of Charleston
- Medical University of South Carolina
- South Carolina State College
- South Carolina Wildlife and Marine Resources Department
- University of South Carolina

The Consortium is charged with bringing together and coordinating the diverse and extensive talents and expertise of its constituent institutions to assist the state in

resolving coastal and marine issues. Three distinct advantages are realized by this "partnership" mechanism:

— Duplication, often a problem in scientific research, is avoided by encouraging cooperation among the different institutions and among different disciplines within the institutions.

— The promotion of manpower sharing results in greater productivity and lower costs

— The ability to put together teams of faculty and staff from the various member institutions to help solve problems of concern to the state maximizes the effectiveness of existing personnel at the lowest possible cost. Because of this, the South Carolina Sea Grant Consortium office can operate efficiently with a very small staff.

In its first three years of operation as an independent state agency, the Consortium has expanded its efforts in marine research programs, educational activities, and technical and advisory services: it serves as a "broker" between its member institutions and those individuals, industries, and agencies that can benefit from the results of such a range of programs. The emphasis is placed on applied research based upon the needs identified by potential users; the information gained from Consortium activities is then transferred to those users. In other words, the Consortium acts as an information synthesis and dissemination clearinghouse.

The Sea Grant Consortium is primarily responsible for the administration and management of the Sea Grant Program for the State of South Carolina. The National Sea Grant College Program, signed into law in 1966, awards competitive grants to some 31 coastal and Great Lakes states for the express purpose of accelerating the national development of marine resources, including their conservation, proper management, and economic utilization. It is through research, education, and advisory work that the objectives of the National Sea Grant Program are implemented and realized.

The Consortium thus derives its major funding from two sources — The State of South Carolina and the federal government through the National Sea Grant College Program. Through an annual appropriation from the State, the Consortium receives funding to support the staff, program overhead, and the program development fund. The National Sea Grant Office provides funding primarily for full-scale research, education, and advisory service projects. This commitment by both the state and the federal government in supporting the Sea Grant Consortium is representative of the cooperative nature of the Sea Grant Program in addressing coastal and marine resource issues.

The Consortium is guided in its policy decisions at the state level by its Board of Trustees. The Board, which consists of the chief executive of each of the Consortium's member institutions, meets quarterly to review the Consortium's program and to propose new directions for broadening the scope of its activities.

To facilitate the interaction between the Consortium and its member institutions, a Sea Grant Coordinator has been designated by the Director at each of the

seven institutions. There, the coordinators serve to further the objectives of the Sea Grant program in the state and ensure the best utilization of talent and expertise found within Consortium member institutions.

Actual research, education, and advisory work on Consortium projects is, of course, carried out by the faculty and staff at the institutions. Their expertise and talent are the strengths of the South Carolina Sea Grant Consortium; enabling it to meet the challenge of developing and managing coastal resources in an efficient and comprehensive fashion. Both faculty and staff approach this challenge from the variety of perspectives inherent in their multi-disciplinary fields.

PROGRAM DEVELOPMENT

The South Carolina Sea Grant Consortium has instituted a structured mechanism for its program identification and development process. Program areas are identified by the Consortium staff and Institutional Coordinators in consultation with state and federal natural resource agencies, private industry, and Marine Advisory Service personnel. Figure 1 illustrates the program identification and development process followed by the Consortium leading ultimately to final review by the National Office of Sea Grant.

For fiscal year 1982-1983, the Consortium received some 90 pre-proposals in response to its call for proposals, totaling more than 1.7 million. Review of these pre-proposals by the Consortium staff and Institutional Coordinators, and by various state agencies and entities with interests and responsibilities in marine resource development and management, was followed by submission of invited, fully developed proposals. These proposals were then reviewed by qualified professionals nationwide. Of these, 22 proposals were included in the FY 1982-83 proposal package to the National Office of Sea Grant for final review and consideration, and 16 were subsequently funded. These are listed in the next section.

In addition to federal Sea Grant project support, the Consortium Director is provided federal and state development funds to allow for program flexibility and prompt response to high priority needs, to encourage innovative ideas and approaches, and to provide special support as needs arise. A sizeable number of discretionary projects were funded during FY 1982-83 in program areas that will provide a base of information to build and strengthen the Sea Grant Consortium program in future years and support the effective conservation and utilization of the State's marine and coastal resource. These projects include:

— "A Biological Evaluation of the Knobbed Whelk Fishery in South Carolina: Its Application to Management of the Resource" (Anderson, Eversole) ($4,500 state). MRRI, Clemson; SD 83-1

— "Coastal Wetland Impoundments: Preliminary Studies of the Nutrient and Aquatic Productivity of the South Island Impoundments" (McKellar) ($3,550 state). University of South Carolina; SD 83-2

— "Advisory Work — Summer 1982" (Dean) ($1,500 state). University of South Carolina; SD 83-3

— "National Marine Education Conference — Travel" (Allen) ($1,000 state). University of South Carolina; SD 83-4

— "Cooperative Maritime Issues" (Hamill) ($700 state). College of Charleston; SD 83-5

— "Age Determination and Ecology of South Carolina Swordfish — Supplemental Award" (Dean) ($1,950 state). University of South Carolina; SD 83-6

— "Natural History of the AIWW: Supplement to the Coastal Cruising Guide" (Forsythe) ($1,150 state). Citadel; SD 83-7

— "The Role of Lysyl-tRNA Synthetase from Shrimp in Synthesizing Regulatory Dinucleotides" (Hilderman) ($4,000 state). Clemson; SD 83-8

— "Society for Environmental Toxicology and Chemistry National Meeting — Travel" (Harder) ($460 state). University of South Carolina; SD 83-9

— "A Precursor Evaluation for the Management of Groundwater Resources on Isle of Palms and Sullivans Island, South Carolina — Phase II supplement award" (Shelton) ($1,650 state). University of South Carolina; SD 83-11

— "History of South Carolina Fisheries — CHP — Supplement Award" (Bishop) ($2,550 state). Marine Resources Research Institute; SD 83-12

— "The Evaluation of Mosquito Production in Coastal Impoundments" (Tidwell) ($6,200 state). Citadel; SD 83-13

— "Use of Wingwalls to Minimize Adjacent Shoreline Erosion at Vertical Bulkheads" (Sill) ($6,500 state; $10,000 S. C. Coastal Council). Clemson; SD 83-14

— "Groundwater Recharge Potential of Freshwater Wetlands, Hilton Head, South Carolina" (May) ($6,900 state; $5,000 S. C. Coastal Council). Citadel; SD 83-15

— "Lease Fees for Oyster Lands in South Carolina" (Hite) ($6,000 state). Clemson; SD 83-16

— "Honorarium — Caribbean Marine Development Workshop" (Brana-Shute) ($250 state). College of Charleston; SD 83-17

— "Legal Advisory Services Program" (Montgomery) ($5,500 state) University of South Carolina; SD 83-18

— "Tourism Forecasting Model — Charleston, S. C. Region" (Stough) ($900 state). College of Charleston; SD 83-19

— "Sea Grant/National Marine Fisheries Service Workshop on Research Priorities and Needs Concerning Commercial Fisheries" (Hite) ($275 state). Clemson; SD 83-20

— "Travel Support for Dr. Gary Brana-Shute to the Vincientiennes" (Brana-Shute) ($700.00 state). College of Charleston; SD 83-21

— "A Cooperative Program in Marine Studies with Emphasis on Minority Education Institutions — Lodging Costs" (Arrington) ($750.00 state). South Carolina State College; SD 83-22

CONSORTIUM PROJECT IDENTIFICATION AND DEVELOPMENT PROCESS

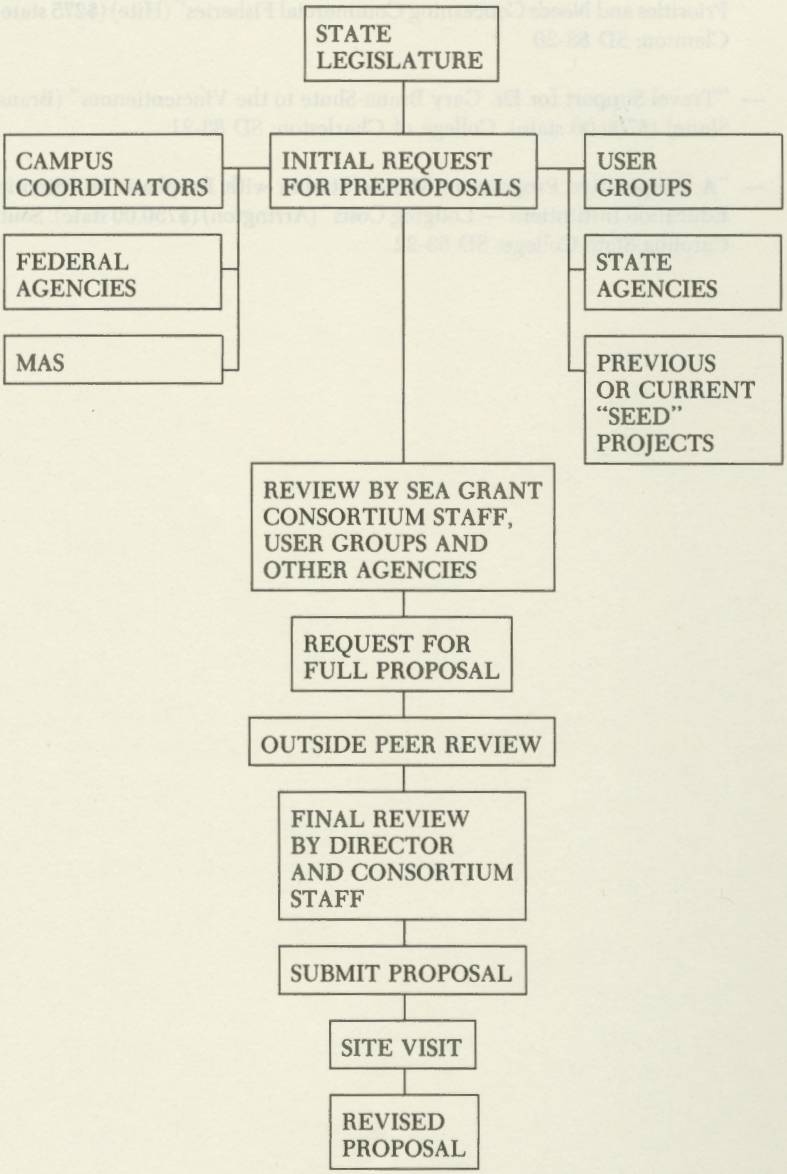

Figure 1

SEA GRANT PROGRAM DESCRIPTION AND REVIEW

The South Carolina Sea Grant Consortium manages and administers the Sea Grant Institutional Program for the state. As its primary responsibility, the Consortium develops a program that focuses on institutional research, marine education, and marine advisory services. Since 1980, the Consortium has administered over $3 million in federal and state-appropriated funds for over 135 research, education, and advisory service projects. For the 1982-83 fiscal year, some 44 projects were funded at a combined federal-state level of over $900,000 effects accrue to the state, the region, and, in some cases, the nation from these investments.

INSTITUTIONAL RESEARCH

Marine and coastal research programs undertaken by Consortium institutional investigators can be divided into six functional categories:

— Aquaculture Development and Management
— Impoundment Studies
— Fisheries Development and Management
— New Marine Product Development
— Environmental Research
— Coastal Resource Development and Management

AQUACULTURE DEVELOPMENT AND MANAGEMENT

Aquaculture research and development has evolved more slowly in the United States as compared with the major aquaculture countries of the world. However, with growing consumer desire for seafood creating increasing demand, the concept of aquaculture has been gaining more and more attention. This is true for South Carolina where a variety of species, including prawns, hard clams, crawfish, and striped bass, are being examined for their desirability as aquaculture species, basically as a result of Consortium research initiatives.

Consortium aquaculture research efforts have focused on the aforementioned species, but have also included eel, channel bass, and baitfish. The research varies from species to species, ranging from basic biological studies on reproduction and development of candidate species, to applied studies on the economics, management, and marketing of viable culture species.

One aquaculture project having direct bearing on decapod crustacean aquaculture has demonstrated that *in vitro* fertilization and artificial insemination techniques for hybridization of freshwater prawns and marine shrimp can be used successfully. The investigator anticipated that research efforts would produce hybrid and selectively bred crustaceans better suited for commercial aquaculture. The techniques developed for these purposes will provide other scientists methodologies for reproduction studies on decapod crustaceans.

The second year objectives of a continuing aquaculture project involve the development and demonstration of large-scale commercial culture of hybrid bass in net pens in South Carolina coastal waters. This project provided the initial biological basis for the eventual establishment of large-scale production of hybrid bass in estuarine net pens.

A new research project sought to assess the value of flow culture system in the early growout of juvenile hard clams, *Mercenaria mercenaria*, as compared to conventional nursery culture systems. The results of this proposed two-year effort will help elucidate the ecological efficiency of *M. mercenaria* populations in open nursery systems, provide deliniation of requirements for mollusk nursery characteristics in relation to carrying capacity and ambient environmental parameters, and evaluate the economics of upwelling (fluid bed) culture in comparison with traditional culture systems.

Fy 82-83 Projects

Development of Techniques *In Vitro* Fertilization of Decapod Crustaceans; Dr. Paul Sandifer, South Carolina Wildlife and Marine Resources Department

Development and Demonstration of Finfish Mariculture in South Carolina; Drs. T. I. J. Smith and Paul Sandifer, South Carolina Wildlife and Marine Resources Department

Nursery Culture of Juvenile Mollusks: Comparative Analysis of Experimental and Conventional Systems for *Mercenaria mercenaria;* Dr. John Manzi, South Carolina Wildlife and Marine Resources Department

Publications and Presentations — *Eels*

Field, D. W. 1983. Parasites of cultured American eel *(Anguilla rostrata)*. M. Sc. Clemson Univ., Clemson, SC.

Davis, J. F. 1982. Pathogenic bacteria associated with cultured American eels *(Anguilla rostrata)* and the effect of *Ecteinascidia turbinata* extract on enhancing the American eel's resistance to a pathogenic bacterium *(Aeromonas hydropjila)*. M.Sc. Clemson Univ., Clemson, SC.

Davis, J. F. and S. S. Hayasaka. 1983. Pathogenic bacteria associated with cultured American eels *(Anguilla rostrata)*. J. Fish Biol (submitted).*

Davis, J. F. and S. S. Hayasaka. 1983. The effect of *Ecteinascidia turbinate* extract on enhancing the American Eel's *(Anguilla rostrata)* resistance to a pathogenic bacterium *(Aeromonas hydrophila)*. J. Fish Biol (submitted).*

Davis, J. F. and S. S. Hayasaka. 1982. Pathogenic bacteria associated with cultured American eels *(Anguilla rostrata)*. Paper presented at the SCB-ASM joint-meeting, Jekyll Island, GA.

Davis, J. F. and S. S. Hayasaka. 1983. Pathogenic bacteria associated with cultured American eels *(Anguilla rostrata)* and the effect of *Ecteinascidia turbinata* extract on enhancing the American eel's resistance to a pathogenic bacterium *(Aeromonas hydrophila)*. Paper presented at the national ASM meeting, New Orleans, LA.

Publications and Presentations — *Prawns*

Liao, D. S. and T. I. J. Smith. 1983. Economic Analysis of Small-Scale Prawn Farming in South Carolina. Presented at 14th Annual Meeting of the World Mariculture Society, Washington, D. C. January 1983.

Smith, T. I. J., W. E. Jenkins and P. A. Sandifer. 1983. Indoor nursery systems for rearing Malaysian prawns. Presented at 14th Annual Meeting of World Mariculture Society, Washington, D. C., January 1983.

Smith, T. I. J. and P. A. Sandifer. 1983. Development of prawn *(Macrobrachium rosenbergii)* farms in temperate climates: Prospects and problems in the USA. Presented at First International Biennial Conference on Warm Water Aquaculture — Crustacea, Laie, Hawaii, February 1983.

Publications and Presentations — *Shrimp and Crawfish*

Dougherty, W. J. and P. A. Sandifer. 1982. Preliminary ultrastructural and histological observations on spermatogenesis in the prawn, *Macrobrachium rosenbergii*. Abstract. Presented at Annual Meeting of the Southeastern Electron Microscopy Society, May 1982, Charleston, SC.

Harris, S. E. G., P. A. Sandifer, and W. B. Greene. 1982. Ultrastructure of the egg of *Macrobrachium rosenbergii* (de Man) and *Palaemonetes* spp. Abstract, Annual Meeting, Southeastern Electron Microscopy Society, May 1982, Charleston, SC.

Dougherty, W. J. 1983. Junctional relationship between germinal cells and sustentacular cells in the testes of the shrimp, *Macrobrachium rosenbergii*. Anat. Rec. (in press).

Lynn, J. W. and P. A. Sandifer. 1983. Features of the reproductive cycle of caridean shrimp. Presented at Annual meeting of the World Mariculture Society, 9-13 Jan. 1983, Washington, D. C.

Bishop, J. M., S. E. G. Harris, and P. A. Sandifer. 1982. Spermatophore transfer in the freshwater prawn, *Macrobrachium rosenbergii*. Presented at Southeastern Estuarine Research Society meeting, Oct. 1982, Marineland, FL.

Sandifer, P. A., A. L. Lawrence, S. G. Harris, G. W. Chamberlain, A. D. Stokes, and W. G. Bray. In review. Electrical stimulation of spematophore expulsion in marine shrimp, genue *Penaeus*.

Publications and Presentations — *Hard Clams*

Manzi, J. J., F. S. Stevens, M. Y. Bobo, V. G. Burrell, Jr. and N. Hadley. 1982. Size and volume relationships in juvenile *Mercenaria mercenaria*: A revision of Belding's Tables. 74th Joint NSA-SINA Convention, Baltimore, MD, June 1982.

Manzi, J. J., M. B. Maddox, F. S. Stevens, H. Q. M. Clawson. 1983. Upflow nursery culture systems for juvenile hard clams, *Mercenaria mercenaria*. 13th Annual Meeting World Mariculture Society, Jan. 1983, Washington, D. C.

Manzi, J. J. 1983. Clam aquaculture in the United States. In: (J. Huner and E. Brown, Eds.) Invertebrate Aquaculture in the United States. AUI Publishing Co., Westport, CT (in press).

Brown, J. W., J. J. Manzi, H. Q. M. Clawson and F. S. Stevens. 1982. Moving out the learning curve: An analysis of hard clam, *Mercenaria mercenaria*,

nursery operations in South Carolina. 74th Joint NSA-SINA Convention, Baltimore, MD, June 1982.

Clawson, H. Q. M. and J. J. Manzi. 1983. Planning and management controls for aquaculture. 13th Annual Meeting World Mariculture Society, Jan. 1983, Washington, D. C.

Hadley, N. H. and J. J. Manzi. 1982. Some relationships affecting growth of seed clams *(Mercenaria mercenaria)* in raceways. 74th Joint NSA-SINA Convention, Baltimore, MD, June 1982.

Hadley, N. H. and J. J. Manzi. 1983. Growth of seed clams *(Mercenaria mercenaria)* at various densities in a commercial nursery in South Carolina. Aquaculture (in press).

Manzi, J. J. 1982. Hard clam culture in South Carolina. Graduate Seminar Series University of South Carolina, Columbia, December.

IMPOUNDMENT STUDIES

In South Carolina, some 14-16% of an estimated 200,000 hectares of wetland are currently impounded, primarily as a result of the flourishing rice culture industry during the 19th and very early 20th centuries. Interest in utilizing the productivity of impounded wetland areas has increased dramatically in the past 5 years. It is conceivable that impounded aquaculture could be a significant new economic activity along the Southeast Atlantic coast. However, there are many questions that have arisen from the increasing level of interest in utilizing impoundments in South Carolina and elsewhere in the nation.

It is for these and other reasons that a multi-institutional and multi-disciplinary 3-year study has been structured. Investigators from 5 of the Consortium's member instructions, representing 5 major disciplines, seek to obtain information on the ecological functioning of coastal impoundments and, based on these results, propose to develop alternative guidelines for the management of impoundment.

The results of this study will help fill a large void in understanding the processes, production dynamics, and biotic and abiotic inter-relationships of impoundments. They will allow for the eventual economic comparison of impounded wetland systems with natural systems. In addition, proposed manipulative studies will provide resource managers and users with important preliminary data on the management of indigenous species and the culture of commercially valuable crustaceans and finfish. The development of guidelines for impoundment management will assist these and other private, state, federal, and, possibly international, natural resource user groups in their efforts.

FY 82-83 Projects

Coastal Wetlands Impoundments: Ecological Characterization and Development of Management Strategies for Aquaculture and Other Uses; Drs. Paul Sandifer and John Dean, South Carolina Wildlife and Marine Resources Department and the University of South Carolina.

FISHERY DEVELOPMENT AND MANAGEMENT

Although commercial aquaculture in South Carolina may prove to be an excellent supplementary source of needed seafood products, it can only be

expected to provide a fraction of consumer seafood demand in the near future. Thus, the growing demand for seafood must be satisfied by existing fisheries of the state and region. For the short term, research in all aspects of the development and management of South Carolina's natural fisheries must continue. The research proposals offered this year encompass a range of important studies necessary for the proper development and management of South Carolina's fisheries resources.

One research project being funded is a continuation of an effort to investigate the reproduction and development of sharks and rays. These species are now objects of commercial, experimental, and sports fisheries in the Southeastern United States, and with the domestic and export market expanding, a renewed interest in this elasmobranch fishery has developed. Project results will provide a more accurate estimate of the size and nature of the shark fishery and will provide detailed information on the local elasmobranch populations. This data is necessary for the construction of models for a sustained yield fishery, which are necessary for the management of this relatively young fishery.

A continuing research project will further describe the age structure of swordfish inhabiting the waters off the South Carolina coast. Results of this study will provide a valuable data base for use in developing and implementing management plans. Also, the aging technique that evolves from this study will serve as a tool for the examination of other pelagic predators.

FY 82-83 Projects

Reproduction and Development of Sharks and Rays; Dr. John Wourms, Clemson University

Age Determination and Ecology of South Carolina Swordfish; Dr. John Dean, University of South Carolina

Publications and Presentation — *Sharks and Rays*

Hamlett, W. C. and J. P. Wourms, Electron microscopy of a shark yolk sac placenta prior to implantation and differentiation. Micron: In Press.

Publications and Presentations — *Swordfish*

Wilson, Charles A. Billfishes in the Blue Water off of South Carolina. Baruch Public Lecture Series. Georgetown, S. C. Spring 1982.

Wilson, C. A. and Dean, J. M. Age Estimation in Billfish. South Carolina Fishery Workers Association. Clemson, SC. February 1982.

Dean, J. M. and Wilson, C. A. Sexual Dimorphism in Billfish. S. C. Academy of Science. Clemson, SC. Spring, 1982.

Wilson, C. A. and Dean, J. M. Age and Growth Rate Analysis of Atlantic Swordfish. S. C. Academy of Science. Clemson, SC. Spring, 1982.

Dean, J. M. Wilson, C. A., Haake, P. W. and Beckman, D. W. Microstructural Features of Teleost Otoliths. 5th International Biomineralization Symposium, Renesse, Netherlands. June 1-5, 1985.

Wilson, C. A. and Dean, J. M. The potential use of sagittal otoliths for estimating age of Atlantic Swordfish. Symposium of International Workshop on Age Determination of Oceanic Pelagic Fishes — Tuna, Billfishes, Sharks. Miami, Florida. February, 1982.

NEW MARINE PRODUCT DEVELOPMENT

The pharmaceutical industry currently spends billions of dollars each year on the research and development of new and better products; however, it is only recently that attention has been focused on exploring marine sources for these products. But, as the discovery of new and better pharmaceuticals and medicinal agents from the oceans is becoming more promising and rewarding, the South Carolina Sea Grant program is offering the following continuing proposal for this year. It has the potential to develop medicinal extracts and/or agents that would contribute significantly to the prevention and control of diseases for man.

In a continuing project, further studies are proposed to isolate and identify chemicals in coastal plants that possibly could be used as medicinal agents. Of the most important drugs used world-wide, more than half come from natural sources; the rest are derived directly or indirectly from petroleum. With the escalating demand for petroleum and natural food products, alternative sources for existing and new drugs must be sought. Research from the first three years of this study, which is being conducted in cooperation with the National Cancer Institute, has produced several classes of compounds; with further study, these will be completely purified and categorized.

FY 82-83 Projects

Isolation, Purification, and Characterization of New Medicinal Agents of the Salt Marsh; Dr. Tom Bryson, University of South Carolina

Publications and Presentations — *Invertebrate Substances*

Hightower, J. A., McCumber, L. J., Welsh, M. G., Whatley, D. S. Hartvigsen, R. E., and Sigel, M. M. Blood cells of the *Fundulus*. *Anat. Rec.* 204:399, 1982.

Hightower, J. A., Welsh, M. G., McCumber, L. J., Whatley, D. S., Hartvigsen, R. E., and Sigel, M. M. Granulocytes of the *Fundulus*. *Anat. Rec.* 205:81A, 1983.

Sigel, M. M., Lichter, W., McCumber, L. J., Chaffar, A., Whellham, L. L., and Hightower, J. A. A substance from the marine tunicate *Ecteinascidia tirbinata* with selective action on macrophages. Presented at Conference on Mononuclear Phagocyte Biology, Wrightsville Beach, North Carolina, May 17-19, 1982. In press, 1983.

MARINE ENVIRONMENTAL RESEARCH

Recent interest in the marine and coastal environment is based primarily on its scientific and economic value. Exploitation of the various types of resources in this environment has led to increasing demand and, ultimately, to competition for the right and access to those resources. Coupled with increased exploitation, i.e., industrial development, shipping, fishing, and recreation, degradation of the marine environment, in one form or another, is almost always inevitable. Research in this area seeks to understand and develop solutions to environmental issues that exist in South Carolina and the Southeast.

One continuing project seeks to document the effects of toxaphene insecticides on marine and aquatic organisms. Because of the location of North Inlet, where the research is being conducted, studies at this estuary offer a major opportunity to

document the impact of aerial input of toxaphene on an east coast ecosystem, specifically on oysters and plankton.

FY 82-83 Projects

Atmospheric Deposition of Toxaphene and Other Organochlorines at North Inlet Estuary: Uptake Responses of Oysters and Plankton: Dr. Terry Bidlemen, University of South Carolina.

Publications and Presentations — *Toxaphene*

M. T. Zaranski, V. J. Homer, and T. F. Bidleman, "Comparison of Toxaphene Residues in Environmental Samples with Laboratory-Weathered Standards Using Capillary EC-GC and Computer-Assisted Pattern Recognition". Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy. Atlantic City, NJ, March, 1982.

V. J. Homer and T. F. Bidleman, "Toxaphene Degradation in Model Reducing Systems". Society of Environmental Toxicology and Chemistry, 3rd Annual Meeting, Arlington, VA, November, 1982.

T. F. Bidleman, "Aerial Transport and Deposition of Organochlorines", NATO Workshop on the Air/Sea Exchange of Particles and Gases, Durham, NH, July 1982.

COASTAL RESOURCE DEVELOPMENT AND MANAGEMENT

Coastal management issues in South Carolina are of the utmost importance to coastal zone planners, managers, and developers. The state has an approved Section 306 Coastal Zone Management Program which is implemented by the South Carolina Coastal Council. The Sea Grant Consortium has undertaken contracts with the Coastal Council in investing important coastal zone issues. The Consortium also examines coastal management issues under the Sea Grant program. This year's Sea Grant program contains two new projects which examine coastal issues in South Carolina. These projects represent needs of the state in terms of coastal decision-making, planning, and assessment.

The first of these projects addresses the issues related to the establishment of user fees for coastal resources. This management "tool" had been proposed as a method for allocating scarce public resources more equitably, while enhancing the ability of various levels of government to increase their revenue. However, an analysis of the feasibility and utilization of user fees in South Carolina had not been conducted. The project results serve as a preliminary assessment of the issues related to user fee charges, and provide background information for further refinement and discussion.

With modification currently being made to the Federal Flood Insurance Program, the availability of alternative flood insurance becomes an important national issue. A new project was proposed to examine this issue. This effort provides timely information to coastal property owners on alternatives for flood insurance protection. In addition, by projecting the nature of development that results on barrier islands because of federal flood insurance program changes, local governments and state agencies can ascertain potential impacts on the tax base, the

level of governmental services, and trends in future development.

FY 82-83 Projects

User Fees for Coastal Resources: Issues of Application and Implementation: Dr. Mark Tompkins, University of South Carolina

A Projection of the Commercial and Private Development to Result from Changes in the Availability and Cost of the Federal Flood Insurance Program; Dr. Gary Griepentrog, University of South Carolina

MARINE EDUCATION

As previously mentioned, the South Carolina Sea Grant Consortium established a Sea Grant Marine Education Study Group as one of its first actions in administering the state's Sea Grant Program. The Study Group, established in order to provide for the development of the educational component of the South Carolina Sea Grant Program, was charged with the task of assessing various educational activities that would be appropriate for Sea Grant support in South Carolina and developing a series of recommendations as to which activities would best serve Sea Grant educational goals. The three marine education projects proposed this year were generated as a response to the recommendations of the Marine Education Study Group.

The second year of one education project seeks to continue the development of an applied science and marine affairs curricula in the Charleston Higher Education Consortium's (CHEC) graduate program. The development of an applied science and marine affairs curriculum in CHEC will provide graduate students in Coastal South Carolina opportunities for interdisciplinary educational and research activities in a broad range of marine issues. Further, inasmuch as several state and federal agencies empowered with the management and regulation of marine resources are located in the Charleston area, would ensure the development of a professional cadre with the requisite holistic approach to the region's coastal and marine resource problems.

A new education project this year addresses the need to expand the Grades K-12 marine education program in South Carolina. The investigator initiated this effort via a training program for approximately 50 elementary and 25 secondary school teachers, who will then implement marine education programs in their schools after training. The proposed training sessions will make use of existing materials, pilot programs and the publication of project reviews and will contribute to fulfilling the needs indentified by the South Carolina Sea Grant K-12 Marine Education Study Committee and the State Natural Resources Education Council.

The last marine education project conducted this year utilizes the human and physical resources of the University of South Carolina to provide research apprenticeships in marine science to minority students enrolled at South Carolina State College. As a result of a Consortium development project, this project involved the participation of several students in research projects and seminars during the academic year. During the summer, students were involved with research at the Belle W. Baruch Institute for Marine Biology and Coastal Research field station.

Marine Education FY 82-83

Development of an Applied Science Curriculum in the Charleston Higher Education Consortium's Graduate Program; Dr. Roger Stough and Dr. Paul Sandifer, College of Charleston and South Carolina Wildlife and Marine Resources Department.

Teacher Training in the Use of Marine Education Materials; Dr. Wendy Allen, University of South Carolina.

A Cooperative Program in Marine Studies with Emphasis on Minority Educational Institutions; Dr. James Arrington, South Carolina.

MARINE ADVISORY SERVICE

South Carolina Sea Grant Marine Advisory Services represents the extension of Consortium member expertise and skills to all the people of South Carolina. Operating under a philosophy of transferring skills and knowledge to various user groups, the goal is to enhance the knowledge of specific constituencies as well as the general public about South Carolina's marine resources and environment through technical assistance and education.

MAS has covered the areas of commercial fishing, aquaculture, recreation, coastal zone management, seafood utilization and general public education. MAS has worked with the Consortium in coordinating workshops on Hard Clam Culture, Crawfish Culture, Marine Baitfish, Prawn Farming, and Aquaculture Legislation. MAS has also worked closely with other Sea Grant programs, the U. S. Coast Guard, National Marine Fisheries Service, National Weather Service, the S. C. Coastal Council, the Cooperative Extension Program, and other governmental entities to bring timely and practical information to specific user groups.

MAS continued to work closely with commercial fishing interests; for instance, using the Turtle Excluder Device, MAS provided the liaison between the fishermen and the National Marine Fisheries Service. MAS worked closely with the National Weather Service to implement a weather observation program using reports from South Carolina fishermen. The fledgling aquaculture industry was the subject of a seminar designed to demonstrate its viability to the banking industry as well as MAS publication efforts. Extension Home Economists and Homemakers received information and instruction regarding the nutritional value and utilization of seafood products.

The Marine Advisory Service designs its activities to meet the needs of marine resource users and provide the information necessary to ensure wise and effective use of South Carolina's marine resources. Through Marine Advisory Service identification of needs, research efforts can be identified and conducted in a responsive and efficient manner. Marine Advisory Service cooperative efforts in the development of new technology and provision of advisory services to coastal and marine related businesses will enhance the sound growth of the economy of South Carolina.

FY 82-83 Selected Accomplishments

Commerical Fisheries

Four issues of "Marine Briefs," the commercial fishery newsletter of S. C. MAS, came out with newsworthy information during the past year covering regulation changes, technology changes, and dockside chatter that is essential to the local fishermen.

Two hundred TED's were made available to the southeast U. S. by NMFS and the Gulf and South Atlantic Fisheries Development Foundation. The South Carolina Marine Advisory Service has placed 22 TED's for inservice testing and has gone back to the TED's builder, Desco Marine, for installation and rigging workshops. A workshop supported by MAS was held in Charleston by NMFS for the TED's and their Turtle Recovery Team. The South Carolina MAS has also shown NMFS three local variations on the TED which are used by at least 15 boats.

Fuel conservation techniques were sent to over 150 fishermen on the coast via "The Marine Briefs" newsletter. This newsletter covered many widely used techniques and a few that were not so well known. As the local coastal fishery heads further offshore, the fuel efficiency of their vessels will be even more crucial, creating new demands on MAS.

In response to the need for accurate weather reporting, the MAS, in conjunction with the National Weather Service and the U. S. Navy, provided a trailer and their contacts with coastal constituents to form the basis of the MAREP (Marine Weather Reporting) system. Through this system the fisherman or recreation boater can report anomalies in the regular NOAA forecasting directly back to NOAA. These anomalies are incorporated in future broadcasts to help make the reports much more reliable.

Aquaculture

Within the last year the acreage of crawfish ponds under culture has doubled from 100 to 200 acres. In conjunction with the Wildlife and Marine Resources Department, the MAS has helped put six individuals into commercial fresh water prawn ventures. A twenty week Aquaculture Technicians Training Program was instituted at a local Georgetown Technical School with the aid of the MAS specialist. To further help in the education process a 200 page Aquaculture Technicians Training Manual was produced for additional classes in other technical schools. This supplements the lectures given to 250 landowners on penaeid shrimp, hard clam, prawn and crawfish culture.

Spearheading the need for a smoother permitting application process for aquaculture efforts, the MAS specialist and Consortium staff are writing a Permitting Guideline Pamphlet. This is being done following the formation of an Ad Hoc Committee of six permitting agency representatives and private industry, brought together by MAS and Sea Grant to address the problem.

As an acknowledgement of the MAS expertise in crawfish culture, the aquaculture specialist was appointed technical advisor to the South Carolina Crawfish Growers Association. This group held a statewide meeting in Charleston with over 60 attendees including restaurant owners, processors, and growers.

The Georgetown specialist did carry out commercial fishery work by helping the NMFS host a Snapper-Grouper Fishery Management Plan meeting in Mur-

rells Inlet. Due in part to MAS effort, this was the largest meeting of its kind in the Southeast.

Marine Recreation/Coastal Development

A biweekly MAS radio program has now been instituted covering such topics as crabbing, lightning protection, Gulf Stream location and boat maintenance. The listening audiences ranged from 1,000 to 15,000 per show. In conjunction with this is a MAS television show with a conservative audience of 50,000, covering such topics as shrimping and crabbing techniques, hurricane protection, loggerhead turtles, and the U. S. Weather Service aids to boaters.

Clemson University's Agriculture Engineering Department has developed an oyster harvester. MAS has brought this harvester to Beaufort to assist the local oyster industry. Initial results are promising, a patent is being applied for. A local firm present at the demonstrations represents one of the only such oyster canning industries on the East Coast.

Working regionally, MAS has now connected South Carolina with a new Southeast Recreational Specialist Network which covers from North Carolina to Texas.

The Beaufort specialist has begun a boater survey for Beaufort County which will help define who the boater is and what some of his critical needs are. This will help in the long range planning and enforcement policies and is being coordinated with other state agencies.

Seafood Utilization

Two shellfish (oyster) workshops were given to 130 Extension Homemaker Club members at the Coastal Carolina Fair. Areas of instruction covered varieties, quality criteria, market forms, selection, handling, storage, preparation, and nutrition.

At the South Carolina Vocational Educational Conference, a workshop was given for over 100 Home Economics teachers in S. C. Besides buyer selection suggestions, fish flaking of fin-fish was demonstrated.

4-H has been given a large amount of effort in order to instill seafood eating habits early in life. Demonstrations for 4-H fish flaking and fish handling techniques were given year round, including the MAS assisted 4-H Marine Institute summer camp.

Over 160 Master Farm Homemaker's Guild Members participated in a coastal seafood cookout held by two MAS Specialists. Many of these people came from the interior states of the U. S. and said they would return knowing what is now available on the coast.

Public Education

The MAS contact with the state's 4-H program has been a traditional one and MAS materials have been used extensively by 4-H in school and summer camp programs.

A program on the commercial fishing industry was presented as part of the Sea Grant Science Teacher In-Service Training Project.

MAS has increased its publications efforts substantially in the past year with two

public information posters on diving emergencies and MAS capabilities in South Carolina. Pamphlets on hurricane preparedness, safe diving procedures, gulf stream location, and basic boat maintenance were distributed state wide.

A SEMAS bibliography on Barrier Beach Erosion has been assembled, distributed, and is now in the process of correction and updating.

COMMUNICATION AND INFORMATION SERVICES

The Consortium initiated its communications program in September, 1981. Since that time, communications has become a strong component of the Consortium's efforts in research, education, and advisory work. A variety of publications have been produced, public service announcements have been aired, news releases disseminated, and several workshops have been coordinated and held. In addition, a Consortium publications policy was developed to fit various publications needs in the technical, general, and advisory services categories.

Emphasis for the FY 82-83 program year was placed on expanding the communications programs to enhance the effective development of current and new innovative programs. Communication and information activities are designed to ensure that concerned audiences receive the benefit of Sea Grant research, education, and advisory activities. Through maximizing the availability of Sea Grant generated information, coastal and marine audiences can use and manage resources in an effective and productive manner. General program objectives as well as specific projects proposed for this year maintain information dissemination and communications links among Consortium staff, Sea Grant programs: they also promote Sea Grant throughout the state, region, and nation.

FY 82-83 Project

Extension Advisory Program, Dr. Lynn Harwell/Thomas Sweeny, Clemson

FY 82-83 Projects

Communications and Information Services, Margaret Davidson/Anne R. Hill, South Carolina Sea Grant Consortium